



# COURSE OUTLINE

## RAA202

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<b>Course Code: Title</b>	RAA202: PLC AND INTERFACING
<b>Program Number: Name</b>	
<b>Department:</b>	ROBOTICS GRADUATE CERTIFICATE
<b>Semester/Term:</b>	18W
<b>Course Description:</b>	The student will develop an understanding of PLC in general, understand the hardware and software associated with Allen Bradley 5000 family PLCs. PLC programming techniques using RS logic 5000 software will be used to design, document and commission basic to intermediate PLC lab assignments. The student will learn how to interface a PLC to control a Robot as the final Lab Assignment. Basic control theory associated with PLCs will be introduced to assist with lab assignment implementation. This course will require the student to work independently and / or in groups during lab times. The student will also be required to work independently on assigned work outside of class time and access information from help files, manuals, and internet as necessary to solve PLC related work problems. This is to prepare the student for PLC job related tasks.
<b>Total Credits:</b>	4
<b>Hours/Week:</b>	4
<b>Total Hours:</b>	4
<b>Prerequisites:</b>	RAA100, RAA102, RAA105
<b>Course Evaluation:</b>	Passing Grade: 60%, C
<b>Other Course Evaluation &amp; Assessment Requirements:</b>	<p>EVALUATION PROCESS/GRADING SYSTEM:</p> <p>(1) Theory Portion of ELR 223 total 35 marks            Test 1 &amp; take Home Q 15 marks 15% overall            Test 2 &amp; take Home Q 20 marks 20% overall</p> <p>(2) Lab Practical Portion of ELR 223 total 40 marks            Practical Test 1 15 marks 15% overall            Practical Test 2 25 marks 25% overall</p> <p>(3) Demonstration and Write-up Portion 17 marks            Lab demonstrations 25 marks 25% overall            Total 100 marks 100 %</p> <p>The following semester grades will be assigned to students in postsecondary courses:</p>

Grade  
Definition Grade Point Equivalent  
A+ 90 - 100% 4.00  
A 80 - 89% 4.00  
B 70 - 79% 3.00  
C 60 - 69% 2.00  
D (Fail) 50 - 59% 1.00  
F (Fail) 49% and below 0.00  
CR (Credit) Credit for diploma requirements has been awarded.  
S Satisfactory achievement in field /clinical placement or non-graded subject area.  
U Unsatisfactory achievement in field/clinical placement or non-graded subject area.  
X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.  
NR Grade not reported to Registrar's office.  
W Student has withdrawn from the course without academic penalty.

**Books and Required Resources:**

Technicians Guide to Programmable Controllers by Cox  
Publisher: Cengage Learning Edition: 6th Edition

Required for Course, Prof will discuss in first class by Student RS Logix Software

**Course Outcomes and Learning Objectives:**

**Course Outcome 1.**

Identify basic PLC hardware and software required for AB 5000 PLCs.

**Learning Objectives 1.**

- State the major advantages of a typical logic controller (PLC ) over conventional hardware relay systems
- Identify the four major components of a typical PLC and describe the function of each
- Define the term discrete
- Define the term analog
- Identify different types of programming devices
- Describe the I/O section of a PLC
- Define the term interposing relay
- Define the term optical isolation
- Describe how basic AC and DC input and output modules work

**Course Outcome 2.**

Develop an understanding of basic PLC ladder logic instructions, numbering systems and Demonstrate hardwiring techniques for AB 5000 PLCs.

**Learning Objectives 2.**

- Describe the proper wiring connections for input devices and their corresponding modules
- Explain why a hard-wire emergency-stop function is desirable
- Describe the function of the PLC's processor
- Identify the two distinct types of memory
- Explain the term on-line programming
- Understand decimal, binary, hexadecimal, binary coded decimal (BCD) numbering

systems

- Identify a hard-wiring diagram
- Understand the Examine ON, OFF, timers, counters move, limits test, sequencers and Internal Storage instructions
- Describe basic programming techniques
- Describe the Force On and Off features and hazards that could be associated with both

### **Course Outcome 3.**

Develop and demonstrate basic programming techniques for AB 5000 PLCs using RS Logic software.

### **Learning Objectives 3.**

- the ability to program basic PLC functions offline
- the ability to program PLCs to control
- the ability to hard-wire PLCs to field equipment
- the ability to add documentation to a PLC program

### **Course Outcome 4.**

Demonstrate the ability to write basic PLC programs to control various electrical equipment in the lab and run the programs in a PLC in the lab.

### **Learning Objectives 4.**

- the ability to download a program to a PLC attached to a PC
- the ability to download a program to a PLC from a remote PC over Ethernet through a gateway server to Data Highway then to a particular PLC in the Lab
- the ability to online edit programs
- the ability to upload a program to a PC from a PLC
- the ability to program basic PLC functions online
- the ability to program PLCs to control Motors, traffic lights, and robot
- the ability to download a program to a local PLC and run a program
- the ability to download a program to a remotely located PLC from room B 1035 to room B 1060 over the Ethernet network to a gateway server to the AB data Highway to a particular PLC and run a program

### **Course Outcome 5.**

Demonstrate the ability to connect PLCs to control various electrical equipment in the lab and run the programs in a PLC in the lab.

### **Learning Objectives 5.**

- the ability to hard-wire PLCs to field equipment and I/O cards
- Use available resources such as internet, manuals, help files, and handbooks to aid in project troubleshooting
- Apply problem-solving techniques and use the knowledge of computer systems and application software to resolve technical problems associated with PLC assigned projects.

- Use appropriate application software for programming, communication and troubleshooting projects
- Wire, test and configure automation and control systems that maybe required by the assigned projects to be connected to a PLC such as Lights, Motors Control, traffic lights, and robot
- Apply, install, test and troubleshoot PLC project related equipment, systems and tasks

**Date:**

Wednesday, December 20, 2017

Please refer to the course outline addendum on the Learning Management System for further information.